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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/003,363	11/15/2001	Yukiko Kubota	010952	4664

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EXAMINER

BERNATZ, KEVIN M

ART UNIT	PAPER NUMBER
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1773

DATE MAILED: 01/10/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

10/003,363

Applicant(s)

KUBOTA ET AL.

Examiner

Kevin M Bernatz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 48-58 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 48-58 is/are rejected.
- 7) ☒ Claim(s) 48 and 56-58 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: ____.

DETAILED ACTION

Response to Amendment

1. Amendments to the specification, cancellation of claims 1 – 10, 12 – 21, 25, 32, 34 and 36 - 47, and addition of new claims 48 - 58, filed on October 13, 2004, have been entered in the above-identified application.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Objections

3. Claims 48 and 58 are objected to because of the following informalities: a space should be located between "80" and "nm" in claim 48 (line 7) and between "40" and "Oe" in claim 58 (line 2). Appropriate correction is required.
4. Claims 56 and 57 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form.

Regarding claim 56, the Examiner notes that the base claim already recites that the magnetic easy axis lies in the radial direction, which is same as stating that the magnetic anisotropy is in a plane parallel to the surface of the recording medium since the magnetic easy axis *is* the magnetic anisotropy direction. I.e. claim 48 already inherently meets the limitation in claim 56.

Regarding claim 57, the Examiner notes that the hard magnetic axis is always perpendicular to the easy magnetic axis, therefore since claim 48 recites that the easy axis is in the radial direction, the hard axis inherently is "perpendicular to said radial direction".

Claim Rejections - 35 USC § 103

5. Claims 48, 49, 51, 52 and 55 – 57 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. (U.S. Patent No. 4,687,712) in view of Mallary et al. (U.S. Patent No. 5,226,966) and Ikeda et al. (U.S. Patent No. 6,468,670 B1).

Regarding claim 48 and 55 - 57, Sugita et al. disclose a perpendicular magnetic recording medium comprising a substrate (*Figure 10, element 12*), a non-magnetic spacer layer directly on the substrate (*element 17*), a laminated soft magnetic underlayer directly on the non-magnetic spacer material comprising two or more layers of a soft magnetic alloy, each of said layers having an as-deposited thickness of approximately 80 nm or less (*elements 13 and 14; Figures 4 and 5; col. 3, lines 3 – 19; and Examples*), and a perpendicular magnetic layer directly on the soft magnetic underlayer (*element 2*).

Sugita et al. fail to disclose the medium being a "circular magnetic recording medium having a hole defined in the center thereof, suitable for use in a magnetic disk drive", nor whether said soft magnetic underlayer possesses an easy axis which lies in the radial direction of the circular magnetic recording medium.

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However, Mallary et al. disclose magnetic disks meeting applicants' claimed structural and intended use limitations capable of storing large quantities of information (*col. 1, lines 22 – 27*) wherein the soft magnetic layer used under a vertical (i.e. "perpendicular") magnetic recording medium is oriented in the radial direction and exhibits "uniaxial anisotropy" (*col. 2, lines 40 – 65*) in order to obtain improved signal strength (see *Paragraph 4 above and, Mallary et al. - col. 3, lines 41 – 57 and col. 4, lines 1 – 9*). The Examiner notes that "uniaxial anisotropy", or the orientation of the magnetic material such that the magnetic field is oriented in one direction (*col. 2, lines 44 – 47*) is equivalent to stating that the soft magnetic layer is a single magnetic domain. Regarding claim 56 and 57, the Examiner notes that Mallary et al. teach a magnetic easy axis in a plane parallel to the surface of the substrate (*col. 3, lines 45 – 48*) and that the hard axis is necessarily perpendicular to the radial direction (*col. 4, lines 4 – 6*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Sugita et al. to use a magnetic disk meeting applicants' claimed structural and intended use limitations wherein the soft magnetic layer possesses a magnetic easy axis in the radial direction as taught by Mallary et al., since such a structure results in a medium capable of storing a large quantity of information while maintaining good signal strength.

Neither Sugita et al. nor Mallary et al. disclose using soft magnetic layers of an iron-cobalt-boron alloy.

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However, the Examiner deems that NiFe and CoFeB are known equivalents in the field of soft magnetic layers for perpendicular media, as taught by Ikeda et al. (*col. 3, lines 25 – 48*).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, NiFe and CoFeB are equivalents in the field of soft magnetic material used in forming soft magnetic layers for perpendicular recording media. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *Graver Tank & Mfg. Co. Inc. v. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Regarding claim 49, Sugita et al. disclose using at least three layers of the same soft magnetic material (*Figure 10 and Examples*).

Regarding claims 51 and 52, Sugita et al. disclose multilayered soft magnetic underlayers meeting applicants' claimed structural limitations (*Figures 4 and 5; col. 3, lines 3 – 19; and Examples*).

6. Claim 50 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. in view of Mallary et al. and Ikeda et al. as applied above, and further in view of Howard et al. (U.S. Patent No. 4,632,883).

Sugita et al., Mallary et al. and Ikeda et al. are relied upon as described above.

None of the above teach using Ta non-magnetic spacer layers between the soft magnetic layers.

However, the Examiner deems that Ti and Ta are known equivalents in the field of non-magnetic spacer materials used above and below soft magnetic layers, as taught by Howard et al. (*col. 1, lines 41 – 44; col. 2, lines 6 – 12; and col. 3, line 63 bridging col. 4, line 10*).

Substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, Ti and Ta are equivalents in the field of non-magnetic spacer layer materials, wherein Ta is a preferred embodiment since it further results in improved perpendicular coercivity of the perpendicular magnetic layer (*col. 2, line 61 bridging col. 3, line 2*).

7. Claims 53 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. in view of Mallary et al. and Ikeda et al. as applied above, and further in view of Fujimura et al. (U.S. Patent No. 5,466,308) and Kraus et al. (IEEE Trans. Mag., 30(2), 1994, 530 - 532).

Sugita et al., Mallary et al. and Ikeda et al. are relied upon as described above.

None of the above teach the exact iron-cobalt-boron alloy percents claimed by applicant.

However, Kraus et al. teach the effect of varying the Fe and Co percentages on the soft magnetic properties of a CoFeB alloy (*Experimental and Figures*) and Fujimura et al. teach the effect of changing the B content in CoFeB alloys (*Figure 2*).

Therefore, the Examiner deems that it would have been obvious to one having ordinary skill in the art to determine an amount of Co, Fe and B meeting applicants'

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claimed atomic percents by optimizing the results effective variable through routine experimentation. *In re Boesch*, 205 USPQ 215 (CCPA 1980); *In re Geisler*, 116 F. 3d 1465, 43 USPQ2d 1362, 1365 (Fed. Cir. 1997); *In re Aller*, 220 F.2d, 454, 456, 105 USPQ 233, 235 (CCPA 1955).

8. Claim 58 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sugita et al. in view of Mallary et al. and Ikeda et al. as applied above, and further in view of Jin et al. (U.S. Patent No. 5,998,048).

Sugita et al., Mallary et al. and Ikeda et al. are relied upon as described above.

None of the above disclose "the saturation field in the direction of said hard axis of said soft magnetic underlayer is greater than or equal to about 40 Oe".

However, Jin et al. teach that large anisotropy fields are desired in soft magnetic materials in order "to raise the FMR frequency so that ferromagnetic resonance does not interfere with the high-frequency operation of the magnetic materials" (*col. 1, line 66 bridging col. 2, line 58*), wherein the anisotropy field can be raised to meet applicants' claimed limitations (*col. 3, lines 2 – 3 and col. 7, lines 3 – 6*).

It would, therefore, have been obvious to one of ordinary skill in the art at the time of the applicant's invention to modify the device of Sugita et al. in view of Mallary et al. and Ikeda et al. to use a soft magnetic underlayer meeting applicants' claimed property limitations as taught by Jin et al. since such a soft magnetic material will insure that ferromagnetic resonance does not interfere with the performance of the magnetic medium.

Response to Arguments

9. The prior rejection of claims 1 – 10, 12 – 21, 25, 32, 34 and 36 - 47 under 35 U.S.C § 112 – 1st Paragraph and/or 2nd Paragraph

Applicant(s) arguments have been considered but are moot in view of the new ground(s) of rejection.

10. The prior rejection of claims 1 – 10, 12 – 21, 25, 32, 34 and 36 - 47 under 35 U.S.C § 103(a) – Sugita et al. in view of various references

Applicant(s) arguments have been considered but are moot in view of the new ground(s) of rejection. In so far as they apply to the present rejection of record, applicant(s) argue that “[a]lthough Mallary, as previously cited by the Examiner, discloses a recording medium having its easy access in the radial direction, Mallary does not disclose a disc having a laminated SUL wherein the laminations are approximately 80 nm or less. The uniaxial anisotropy achieved in the Mallary reference results from the deposition of the SUL in the presence of a magnetic field supplied by the apparatus described in the reference” (*page 5 of response*). While the Examiner acknowledges applicants’ position, the Examiner does not find it convincing.

In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir.

1986). The Examiner notes that Sugita et al. clearly teach laminated SUL's encompassing applicants' claimed thickness limitations.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Akiyama et al. (U.S. Patent No. 5,815,342) teach a laminated-type soft underlayer possessing an easy magnetization in the radial direction, but does not explicitly teach using a cobalt-iron-boron alloy (*entire disclosure*). Shukh et al. (U.S. Patent No. 2002/0028357 A1) and the corresponding provisional application (60/227,943) teach a laminated soft magnetic underlayer comprising iron-cobalt-boron layers of a thickness of 10 – 200 nm, but fails to teach whether the magnetic easy axis direction is radial or circumferential (*entire disclosure*).

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

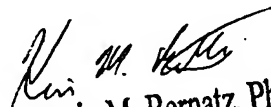
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13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Deborah Jones can be reached on (571) 272-1535. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMB
January 6, 2005


Kevin M. Bernatz, PhD
Primary Examiner